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REVIEW OF  
NATURAL CHINOOK SALMON ESCAPEMENT TRENDS  
IN TRANSBOUNDARY RIVERS OF  
NORTHERN BRITISH COLUMBIA AND SOUTHEAST ALASKA

Prepared for the  
Joint U.S./Canada Northern Panels  
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and  
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# CAUTIONARY NOTE

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This report has been prepared to provide a review of recent chinook salmon escapement trends in the transboundary rivers. Some of the more recent escapement and catch data is preliminary and changes may occur as data is edited and finalized. However, changes in data which may occur are not expected to substantively change the general conclusions and recommendations of this report.

No attempt has been made in this report to include or discuss all information available on the transboundary chinook stocks. Attention has been focused primarily on recent escapement trends relative to the rebuilding program. The reader is referred to the 1985 and 1986 reports of the Transboundary Technical Committee for additional information on management and catches in related fisheries.

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## EXECUTIVE SUMMARY

At the November 1986 meeting of the Pacific Salmon Commission, the joint Canada/U.S. Northern Panels requested the following information:

"Provide a specific assessment of the rebuilding progress for all Transboundary River chinook stocks."

This report, prepared jointly by the Canadian Dept. of Fisheries and Oceans and the Alaska Dept. of Fish and Game, provides the requested information.

Six transboundary rivers in northern British Columbia and Southeast Alaska are currently classified as natural chinook salmon systems. These include the Alsek, Chilkat, Taku, Stikine, Unuk and Chickamin rivers. Transboundary chinook are 'spring type' chinook, rearing one year in freshwater prior to outmigration, and maturing primarily as 4-, 5- and 6-year fish. Chinook run sizes, and proportions of populations spawning and rearing in Canada and Alaska vary substantially between systems. The majority of spawning occurs in Canadian portions of the Alsek, Taku and Stikine, while the majority of spawning in the Chilkat, Unuk and Chickamin occurs in Alaska. Because of their transboundary nature, management of these stocks is coordinated between the two countries under the Pacific Salmon Treaty.

A 15-year, 3 cycle rebuilding program was initiated for depressed transboundary chinook stocks in 1981. In addition to chinook conservation actions begun in the mid-1970s, more restrictive fishery regulations have been implemented since 1981 to reduce catches and increase spawning escapements. The objective is to achieve management escapement goals by 1995. Current escapement goals are based on general considerations of historical catch and escapement data, and on apparent spawning and rearing area capacities; data has not been available for spawner/recruit analysis of optimum spawning levels.

The first cycle or 5-year period of the rebuilding program was completed in 1985. Average escapements increased during 1981-85 in five of the six systems, and decreased in one (Alsek) compared to the base period 1975-80. Percent changes by system are: Alsek: -30%; Chilkat: +460%; Taku: +17%; Stikine: +98%; Unuk: +54%; Chickamin: +215%. The degree of escapement responses have varied substantially between systems and years.

Relative to achievement of current escapement goals, rebuilding is substantially ahead of schedule for two systems, the Unuk and Chickamin. Escapements to these two systems are expected to be near or above goals during the second cycle. Based on escapements observed through 1986, it appears unlikely that goals will be met for the Alsek, and Taku given current trends. Lack of clear recent trends in escapements to the Chilkat and Stikine make progress uncertain in these two systems.

One important pattern in escapement responses has emerged since the rebuilding program was initiated. Chinook escapements to the more southerly transboundary and Southeast Alaska stocks have responded at a much higher rate (119% increase in 1981-85 compared to 1975-80) than central stocks (+ 58%), and northern (Yakutat area) stocks which actually declined (-32%). Based on migratory pattern information obtained from coded wire tagging programs, it appears likely that, prior to 1981 when the rebuilding program was initiated, the more southerly stocks were being harvested by the Southeast Alaska troll fishery at higher rates than the northerly stocks. As a consequence, conservation measures implemented in the troll fishery resulted in greater benefits in the form of increased escapements for the more southerly stocks. Conversely, the more northerly stocks, which were being harvested at lower rates, benefited less. This appears consistent with the known northerly migration pattern of juvenile, ocean rearing chinook.

This does not, however, explain the decline in escapements in the most northerly stocks, such as the Alsek, in spite of reductions in fishing effort and catches in known fisheries. Some possible causes for the decline include environmental conditions, predation by marine mammals, high seas fisheries impacts, or some combination of these factors. The observed pattern, and new information obtained since 1981, has implications relative to optimum spawning levels and appropriateness of current escapement goals, particularly for the northern stocks.

Chinook spawning escapements in the transboundary rivers are expected to continue to improve during the second cycle due to increased escapements observed during the first cycle (except for the Alsek). Strong 4-year chinook returns in 1986 indicate good survival rates for the 1982 brood year which should be reflected in 5- and 6-year returns in 1987 and 1988. In addition, chinook conservations measures during 1986-90 are expected to be more restrictive on average than during 1981-85.

The following recommendations are made:

- (1) Conservation measures enacted since 1981 should be continued to ensure rebuilding of transboundary chinook stocks.
- (2) Returns of stocks exhibiting weak responses to date should be carefully monitored during the early part of the second cycle and incidental catches of chinook reduced when possible.
- (3) The two management agencies should complete the review of escapement goals currently being conducted taking into account new information obtained since the rebuilding program was initiated, and with a view toward resolving differences which exist between goals of the two agencies.

Additional recommendations are made for expanded stock monitoring and research.

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## INTRODUCTION

At the November 1986 meeting of the Pacific Salmon Commission, the joint Canada/U.S. Northern Panels requested the following information:

"Provide a specific assessment of the rebuilding progress for all Transboundary River chinook stocks."

This report, prepared jointly by the Canadian Department of Fisheries and Oceans (CDFO) and the Alaska Department of Fish and Game (ADF&G), is intended to provide the information requested.

Six transboundary rivers in northern British Columbia and Southeast Alaska are currently classified as natural chinook salmon systems. These include, from north to south, the Alsek, Chilkat, Taku, Stikine, Unuk and Chickamin rivers (approximate locations shown in Fig. 0). These are all relatively large, mainland rivers originating in Canada and flowing to the sea through Southeast Alaska.

Virtually all transboundary chinook stocks are "spring" type fish which enter spawning systems during the spring and early summer months. After emergence the following spring, most fry remain in freshwater rearing areas for one year, migrating seaward the following spring as age 2 smolts. Most chinook return to spawning areas after 2, 3 or 4 years of ocean residence as 4-, 5- or 6-year fish. Major spawning results from 5- and 6-year female chinook as virtually all 3- and 4-year chinook returning to spawning areas are males. (Note: On average, slightly over half of brood year returns of males observed on the Nakina tributary of the Taku River are 3- and 4-year fish.)



Relative proportions of transboundary chinook salmon spawning and rearing in Canadian and U.S. sections of these rivers vary substantially between systems. Quantitative information is not available on rearing distributions, however, approximate spawning distributions are shown in the following table.

APPROXIMATE SPAWNING DISTRIBUTIONS OF  
CHINOOK SALMON IN THE TRANSBOUNDARY RIVERS

| River      | Stock Size<br>Classification | Canada  | Alaska  |
|------------|------------------------------|---------|---------|
| Alsek      | major                        | 95-100% | 0-5%    |
| Chilkat    | medium                       | 10-20%  | 80-90%  |
| Taku       | major                        | 95-100% | 0-5%    |
| Stikine 1/ | major                        | 90-95%  | 5-10%   |
| Unuk       | medium                       | 0-5%    | 95-100% |
| Chickamin  | medium                       | 0-5%    | 95-100% |

Size Classification: major: greater than 10,000;  
medium: 1,500 to 10,000

1/ Does not include Andrews Creek.

As shown in the above table, potential run sizes of the transboundary chinook stocks varies substantially. Three systems, the Alsek, Taku and Stikine, are considered "major" chinook systems with potential run sizes greater than 10,000 fish. Three systems, the Chilkat, Unuk and Chickamin are classified as "medium" systems with potential run sizes between 1,500 and 10,000. These size classifications are based on general magnitudes of spawning escapements and, where they occur,

terminal catches. Total production or return information is not available due to harvest of these stocks in mixed stock fisheries and the lack of stock identification methods.

Because of the transboundary nature of these stocks, conservation and management is coordinated between the Canadian Department of Fisheries and Oceans (CDFO) and the Alaska Department of Fish and Game (ADF&G). Since 1985, this has been directed through the Pacific Salmon Commission.

#### TRANSBOUNDARY CHINOOK REBUILDING PROGRAM

A 15-year, 3 cycle rebuilding program was initiated in 1981 for depressed natural chinook stocks originating in transboundary rivers. The objective was to rebuild spawning escapements to management goals by 1995. [Note: This was part of a broader rebuilding program begun by Alaska in 1981 for Southeast Alaska chinook stocks; rebuilding of transboundary stocks was undertaken cooperatively between Canada and Alaska. The 15-year coastwide natural chinook stock rebuilding program, implemented under the Pacific Salmon Treaty, began in 1984 with planned completion by 1998.]

To achieve rebuilding of transboundary chinook stocks, conservation measures implemented since the mid-1970's in near-terminal and terminal fisheries were continued, and in some cases expanded, to protect returning spawners. (Although beneficial, conservation measures implemented prior to 1981 were not adequate to rebuild spawning escapements.) Additional conservation

measures were then implemented in Southeast Alaska fisheries beginning in 1981. These included regionwide spring troll closures to protect migrating spawners and regionwide, all-gear chinook catch limits to reduce harvest of both mature and immature fish. In addition, since 1981, chinook catches by fisheries operating in both Canadian and Alaskan portions of several of the rivers have, for the most part, been limited to catches incidental to catches of other target species.

As part of the rebuilding program, management escapement goals were established for the transboundary rivers beginning in 1981. In the absence of production data, escapement goals were based on the following general considerations:

- (1) maximum escapements observed prior to 1981 when stocks were significantly depressed, and it appeared unlikely that even maximum escapements substantially exceeded optimum levels;
- (2) observed utilization of surveyed spawning areas; and
- (3) historical catch patterns in terminal fisheries on some systems.

These management goals are considered working estimates of optimum escapement levels required to maximize harvest from transboundary chinook stocks. As more information on stock productivity becomes available, these interim escapement goals will be reviewed and modified as appropriate.

Current escapement goals for the transboundary chinook stocks are shown below:

#### ESCAPEMENT GOALS FOR TRANSBOUNDARY CHINOOK STOCKS

| SYSTEM    | ESCAPEMENT GOALS |        |            |        |
|-----------|------------------|--------|------------|--------|
|           | INDEX            | GOAL   | TOTAL GOAL |        |
| -----     | CDFO             | ADF&G  | CDFO       | ADF&G  |
| -----     | -----            | -----  | -----      | -----  |
| Alsek     | 6,250            | 3,200  | 12,500     | 5,000  |
| Chilkat   | NA               | 225    | NA         | 2,000  |
| Taku      | 10,800           | 11,500 | 30,000     | 25,600 |
| Stikine   | 3,000            | 2,140  | 25,000     | 13,700 |
| Unuk      | NA               | 1,765  | NA         | 2,800  |
| Chickamin | NA               | 860    | NA         | 1,400  |

As seen above, CDFO and ADF&G goals are different for some systems. These differences are due both to differences between index goals and index expansion factors. [Some differences also exist between ADF&G goals for the Alsek and Stikine presented in past Chinook and Transboundary Technical reports; resolution of these differences is needed.]

#### ESCAPEMENT MONITORING

Chinook escapements are monitored annually in each of the six transboundary systems. Due to glacial water and physical characteristics of four systems (Alsek, Chilkat, Taku and Stikine), escapements can only be monitored in "index" tributaries which represent a portion of total system escapements. Aerial surveys of peak spawning are the primary source of escapement information for five systems; a weir

is operated by CDFD on the Klukshu tributary of the Alsek River.

Weirs have also been operated on a number of other tributaries in the past. A carcass weir has been used on the Nakina tributary of the Taku since 1951 to obtain biological information on spawning chinook. A weir was operated on the Little Tahltan tributary of the Stikine in 1985-86 for collection of biological data and to calibrate aerial surveys. Partial counts were also obtained in 1985-86 at weirs on the Tatsamenie and Hackett tributaries of the Taku; timing of these weirs operations could be expanded to obtain total tributary counts.

The proportion of total chinook escapements directly enumerated in transboundary rivers varies between systems depending on the counting method or type of survey (weirs or aerial/foot surveys of peak spawning) and the proportion of total spawning area or tributaries surveyed or counted. For purposes of comparison and aggregation of escapements across stocks, estimates of total annual escapements are derived by expanding index escapement counts for (1) survey or counting rates; and (2) proportion of spawning in index or surveyed tributaries. It should be noted that while the same index escapement estimates are used by both CDFD and ADF&G, different survey and tributary expansion factors are used in some cases leading to different estimates of total system escapements.

If chinook are counted at a weir, the counting or survey rate is 1.0, i.e. virtually all spawning fish in the system or index tributary are assumed to have passed through the weir. If index

escapements are based on aerial surveys of peak spawning, only a percentage of the total number of spawners is counted due to protracted spawning and spawner distribution. For transboundary systems, the estimated percentage of spawners counted during peak aerial surveys varies between 50 and 80 percent.

Aerial survey counting rates and index tributary contribution rates currently used to expand index escapements have not been determined by direct measurement or observation in most cases, although some information is available on comparisons of aerial peak spawning counts and weir counts for several systems. Expansion factors used are based on available information and general knowledge of fishery management and research biologists familiar with the systems. Available information suggests that survey counting rates currently used are probably reasonably good first estimates. [Preliminary data comparing weir counts and aerial surveys on the Little Tahltan tributary of the Stikine in 1985-86 indicate an aerial survey counting rate of approximately 50 percent compared to 47 and 62.5 percent currently used respectively by CDFO and ADF&G.] Accuracy of tributary expansion factors is less certain and needs to be verified.

Survey counting rates and index tributary contribution rates used by CDFO and ADF&G for expansion of annual index escapements to estimates of total system escapements are shown for each of the transboundary rivers in Tables 1-6. Annual index escapements and estimated total escapements are also presented for each system.

In the following section, changes and trends in chinook

escapements since the beginning of the rebuilding program in 1981 are compared with average escapements during the base period 1975-80 for each system. (Basic escapement data for individual systems is presented in tabular form in Tables 1-6 and graphically in Figures 1-6.) In addition, relative achievement of escapement goals and an assessment of rebuilding progress is discussed for each system. Canada does not conduct escapement surveys on the Chilkat, Unuk or Chickamin rivers.

#### TRENDS IN CHINOOK ESCAPEMENTS SINCE 1981

In the following section, CDFD and ADF&G escapement estimates are both shown when these estimates are different. Notation used is (CDFD Est./ ADF&G Est.) It should be noted that the same index escapements are used by both agencies; differences in total escapements are due to differences in expansion factors.

##### Alsek River [Data in Table 1 and Figure 1.]

The Alsek River originates in the southwest Yukon Territory and northwest British Columbia, and flows into Southeast Alaska, entering the ocean south of Yakutat Bay. An estimated 95 to 100 percent of natural chinook spawning in the Alsek occurs in Canada with less than 5 percent occurring in Southeast Alaska. Current management escapement goals for the Alsek are 12,500 (CDFD) and 5,000 (ADF&G) chinook spawners of all ages. Escapements of spawners (all ages) are monitored annually at a weir operated by CDFD on the Klukshu tributary.

Estimated total system escapements to the Alsek River averaged (4,100 / 3,161 ) during 1981-85, the first five years of the rebuilding program. This was a decrease of (1,700 / 1,330) spawners or 30 percent below the 1975-80 base period average of (5,800 / 4,500). As a percent of the management goals, average escapements decreased from (46 / 90) percent during 1975-80 to (33 / 63) percent during 1981-85.

In 1986, the first year of the second cycle of the rebuilding program, the chinook escapement to the Alsek increased over recent years levels to an estimated (5,400 / 4,231) spawners. This represented a decline of about 6 percent below the 1975-80 base period but an increase of 34 percent above the 1981-85 average. The 1986 escapement represented (43 to 85) percent of the management goals.

Chinook escapements to the Alsek have not improved during the first cycle of the rebuilding program, and in fact have declined by 30 percent below the 1975-80 base period. Rebuilding to current management escapement goals by 1995 is not expected given the lack of response observed during the first cycle.

#### Chilkat River [Data in Table 2 and Figure 2.]

The Chilkat River originates in northwestern British Columbia and flows into Southeast Alaska, entering the ocean in Lynn Canal north of Juneau. An estimated 80 to 90 percent of natural chinook spawning in the Chilkat River occurs in Southeast Alaska with 10 to 20 percent occurring in Canada at the headwaters of the



Kelsall and Tahini tributaries. The current management escapement goal for the Chilkat chinook stock is 2,000 3- and 4-ocean spawners. Annual escapements of 3- and 4-ocean spawners are monitored primarily through helicopter and foot surveys of peak spawning abundance in the Big Boulder Creek tributary.

Estimated total system escapements to the Chilkat River averaged 1,184 during 1981-85, the first five years of the rebuilding program. This was an increase of 973 spawners or 460 percent above the 1975-80 base period average escapement of 211. As a percent of the management goal, average escapements increased from 11 percent during 1975-80 to 59 percent during 1981-85.

In 1986, the first year of the second cycle of the rebuilding program, the chinook escapement to the Chilkat decreased to an estimated 179 spawners. This represented a decline of 15 percent below the 1975-80 base period and a decline of 85 percent below the 1981-85 average. The 1986 escapement represented only 9 percent of the 2,000 management goal.

Based on escapements observed to date, rebuilding progress for the Chilkat chinook stock is uncertain. If the low 1986 escapement is an exception and the trend in escapements observed during the first five years of the rebuilding program continues, satisfactory progress toward rebuilding should occur. This is expected given the strong escapements observed during 1981-85 and continuation of conservation measures. However, if escapements similar to 1986 continue for several years, achievement of the management goal by the third cycle would be unlikely.

Taku River [Data in Table 3 and Figure 3.]

The Taku River originates in northwestern British Columbia and flows into Southeast Alaska, entering the ocean south of Juneau. An estimated 95 to 100 percent of natural chinook spawning in the Taku occurs in Canada with less than 5 percent occurring in Southeast Alaska. Current management escapement goals for the Taku are 30,000 (CDFO) AND 25,600 (ADF&G) 3- and 4-ocean chinook spawners. Escapements of 3- and 4-ocean spawners are monitored annually by helicopter surveys of peak spawning on the Nakina and Nahlin rivers and other tributaries as noted in Table 3b.

A carcass weir on the Nakina tributary has also been used to collect biological data and may be useful as an index of spawner abundance on the upper portion of the Nakina. Chinook spawners both above and below the carcass weir are enumerated during aerial surveys but the number of large 3- and 4-ocean female chinook recovered at the weir are correlated the peak survey count on the Nakina.

Recoveries at the carcass weir indicate that the sex ratio in the escapement of 3- and 4-ocean chinook is variable. In evaluating rebuilding, it is assumed that increases in the peak count index is indicative of improved potential production. However, if an increase in escapement in one year is largely due to males, this would not be true. Uncertainty about the significance of the 1986 escapement index exists for this reason. The number of females observed at the carcass weir in 1986 was less than would be expected based on the peak survey count of escapement.

Estimated total system escapements to the Taku River averaged (11,600 / 9,300) during 1981-85, the first five years of the rebuilding program. This was an increase of (1,600 / 1,300) spawners or about 17 percent above the 1975-80 base period average escapement of (10,000 / 8,000). As a percent of the management goals, average escapements increased from (33 / 31) percent during 1975-80 to (39 / 36) percent during 1981-85.

In 1986, the first year of the second cycle of the rebuilding program, the chinook escapement to the Taku was estimated at (15,200 / 12,200) spawners. This was an increase of about 52 percent above the 1975-80 base period and an increase of 31 percent above the 1981-85 average. The 1986 escapement represented (51 / 48) percent of the management goals.

Responses of Taku chinook escapements to the rebuilding program have been quite variable (Fig. 3, Table 3). In 1981, the first year of the rebuilding program, the estimated escapement increased to (22,400 / 17,900), an increase of (12,400 / 9,900) spawners or 124 percent above the average base period escapement of (10,000 / 8,000). However, escapements then declined to (10,500 / 8,400) in 1982 and (3,800 / 3,000) in 1983.

Escapements in 1984 increased to (7,900 / 6,300), to (13,600 / 10,900) in 1985 and (15,200 / 12,200) in 1986. (A similar pattern was observed on the Stikine.) The decline in escapements appeared to be due to poor survival of brood years contributing to the 1982-84 returns. Overall conservation

measures have become progressively more restrictive since 1981 as a result of cooperative measures through 1984 and Treaty actions since 1985.

Given the response observed during the first cycle in terms of average increase in escapements, it is unlikely that the Taku chinook stocks would rebuild to current management goals by 1995 unless additional conservation measures are taken.

Stikine River [Data in Table 4 and Figure 4.]

The Stikine River originates in northwestern British Columbia and flows into Southeast Alaska, entering the ocean just north of Wrangell. An estimated 90 to 95 percent of natural chinook spawning in the Stikine occurs in Canada with 5 to 10 percent occurring in Southeast Alaska. Current management escapement goals for the Stikine are 25,500 (CDFD) and 13,700 (ADF&G) 3- and 4-ocean chinook spawners. Escapements of 3- and 4-ocean spawners are monitored annually through helicopter surveys of peak spawning on the Little Tahltan tributary. A weir has been operated on the Little Tahltan during the last two years is providing additional information on aerial survey counting rates which have been near 50 percent each year.

Estimated total system escapements to the Stikine River averaged (16,400 / 12,400) during 1981-85, the first five years of the rebuilding program. This was an increase of (8,100 / 6,200) spawners or nearly 100 percent above the 1975-80 base period average escapement of (8,300 / 6,200). [Note that the 1981-85 average was largely dependent on strong returns in 1981-82.] As

a percent of the management goals, average escapements increased from (33 / 45) percent during 1975-80 to (64 / 90) percent during 1981-85.

In 1986, the first year of the second cycle of the rebuilding program, the chinook escapement to the Stikine was estimated at (10,700 / 8,000) spawners. This was an increase of about 29 percent above the 1975-80 base period but a decrease of 35 percent below the 1981-85 average. The 1986 escapement represented (42 / 59) percent of the management goals.

As seen in Figure 4 and Table 4, responses of Stikine chinook escapements to the rebuilding program have been quite variable. In 1981, the first year of the rebuilding program, the estimated escapement increased to (28,400 / 21,300), an increase of (20,100 / 15,100) spawners or 244 percent above the average base period escapement of (8,300 / 6,200). Following a slightly smaller but strong escapement of (24,100 / 18,100) in 1982, escapement declined to (5,100 / 3,800) in 1983. The 1984 and 1985 escapements of (11,000 / 8,300) and (13,600 / 10,200) increased above 1983 and the base period average of (8,300 / 6,200), but remained below the larger escapements of 1981-82. (The weak 1983 escapement was also observed in the Taku River.) Following two years of increases in 1984-85, the escapement then decreased in 1986 to (10,700 / 8,000) spawners.

Assuming good production results from the strong escapements in 1981-82 and improved escapements in 1984-85, it is likely that rebuilding of Stikine chinook to the ADF&G goal would be achieved

by the third cycle, but possibly not the Canadian goal.

Unuk River [Data in Table 5 and Figure 5.]

The Unuk River originates in northwestern British Columbia and flows into southern Southeast Alaska, entering the ocean in Behm Canal. An estimated 95 to 100 percent of natural chinook spawning in the Unuk occurs in Southeast Alaska with less than 5 percent occurring in Canada. The current management escapement goal for the Unuk River chinook stock is 2,800 3- and 4-ocean spawners. Annual escapements of 3- and 4-ocean spawners are monitored primarily through helicopter surveys of peak spawning abundance.

Estimated total system escapements to the Unuk River averaged 1,980 during 1981-85, the first five years of the rebuilding program. This was an increase of 697 spawners or 54 percent above the 1975-80 base period average escapement of 1,283. As a percent of the management goal, average escapements increased from 46 percent during 1975-80 to 71 percent during 1981-85.

In 1986, the first year of the second cycle of the rebuilding program, the chinook escapement to the Unuk increased to 3,402 spawners. This was 165 percent above the 1975-80 base period and 72 percent above the 1981-85 average. The 1986 escapement was 121 percent of the management goal.

Based on escapements observed to date, rebuilding of the Unuk stock appears to be substantially ahead of schedule. Escapements

are expected to be near the management goal during the second cycle of the rebuilding program.

Chickamin River [Data in Table 6 and Figure 6.]

The Chickamin River originates in northwestern British Columbia and flows into southern Southeast Alaska, entering the ocean in Behm Canal. An estimated 95 to 100 percent of natural chinook spawning in the Chickamin occurs in Southeast Alaska with less than 5 percent occurring in Canada. The current chinook escapement goal for the Chickamin River is 1,400 3- and 4-ocean spawners. Annual escapements of 3- and 4-ocean spawners are monitored primarily through helicopter surveys of peak spawning abundance.

Estimated total chinook escapements to the Chickamin River averaged 1,092 spawners during 1981-85, the first five years of the rebuilding program. This was an increase of 746 spawners or 216 percent above the 1975-80 base period average escapement of 346 chinook. As a percent of the management goal, average escapements increased from 25 percent during 1975-80 to 78 percent during 1981-85. Escapements exceeded the management goal in both 1984 and 1985.

In 1986, the first year of the second cycle of the rebuilding program, the chinook escapement to the Chickamin River increased to 2,683 spawners. This was 675 percent above the 1975-80 base period and 146 percent above the 1981-85 average. The 1986 escapement was 192 percent of the management goal.

Based on escapements observed to date, rebuilding of the Chickamin stock appears to be substantially ahead of schedule. Escapements are expected to be near the management goal during the second cycle of the rebuilding program.

#### DISCUSSION

It should be noted that trends or percentage changes in estimated total escapements are the same as for index escapements.

In reviewing escapement trends for individual systems, it is apparent that substantial variations are occurring in the degree and pattern of escapement responses to the rebuilding program. Percent changes in average escapements to individual systems during the first cycle were: Alsek: -30%; Chilkat: +460%; Taku: +17%; Stikine: +98%; Unuk: +54%; and Chickamin: +215% (Fig. 7 and Table 7).

One pattern in responses that has been observed is that of greater responses in chinook escapements to the southerly stocks compared to the central and northerly stocks. This pattern is reflected not only in the transboundary stocks, but also in the other Southeast Alaska indicator stocks. The following table illustrates this pattern.



CHANGES IN TOTAL CHINOOK ESCAPEMENTS FOR SOUTHEAST  
ALASKA AND TRANSBOUNDARY INDICATOR STOCKS GROUPED  
ACCORDING TO THREE GEOGRAPHICAL REGIONS  
(ALASKA ESTIMATES ONLY SHOWN.)

| Location (Stocks)   | Average Total Escapement<br>1975-80 | 1981-85 | Percent<br>Change |
|---|-------------------------------------|---------|-------------------|
| Southern<br>(Unuk, Blossom,<br>Chickamin, Keta)                 | 2,200                               | 4,815   | +119%             |
| Central<br>(Stikine, Andrews,<br>King Salmon, Taku,<br>Chilkat) | 14,881                              | 23,526  | + 58%             |
| Northern / Yakutat<br>(Alsek, Situk)                            | 6,058                               | 4,133   | - 32%             |

As seen in the above table, the four most southerly indicator stocks in the Behm Canal area experienced an average increase of 119 percent during 1981-85. Average escapements to the four indicator stocks in the more central portion of the region increased by 58 percent, or about half the rate of the Behm Canal stocks. Finally, escapements to the most northerly indicator stocks, the Alsek and Situk rivers in the Yakutat area, actually decreased by 32 percent.

At least two factors are thought to be contributing to this pattern. First, and probably most important in terms of relative impact, the more southerly stocks were apparently being harvested by local marine fisheries at higher rates prior to the rebuilding program, and therefore benefited to a greater extent from fishery restrictions implemented for rebuilding. The central and more northerly stocks, were being harvested at lower rates, and subsequently benefited less from fishery restrictions.

Coded wire tagging of both natural and hatchery stocks has demonstrated a greater tendency for the more southerly stocks to contribute, both as immature and mature fish, to marine fisheries throughout the region, particularly to the Southeast Alaska troll fishery where the major chinook catch restrictions have been imposed. This appears to be due in part to the general northerly migration pattern of most juvenile chinook after they enter the ocean, which results in the more southerly stocks remaining in Southeast Alaska waters to a greater extent during ocean residency. (Coded wire tagging of Taku natural chinook fry, for example, suggests that Taku stocks are available to the Southeast Alaska troll fishery primarily as mature fish during spring spawning migrations periods, which have been closed to fishing during the rebuilding program, with few recoveries of immature fish being made at other times of the year.)

A second factor which may contribute to this pattern is the higher, and more consistent, return per spawner rates for the more southerly chinook stocks, which spawn and rear in generally milder climatic conditions. (Productivity of other salmon species is also generally higher, and more consistent, in the southern portion of the region.) More variable returns have been noted for the central and northern stocks, particularly the Stikine, Taku, and Chilkat.

If the more northerly stocks were in fact contributing to marine fisheries at a lower rate, a weaker response in escapements might be expected when conservation measures were implemented. However, the observed decline in escapements in the Alsek

(and Situk) would not be expected. (It should be noted that inriver catches were reduced substantially in 1981-85 compared to 1975-80, and that total inriver returns declined in both systems in spite of significantly expanded conservation measures.)

Returns during 1981-85 may have declined due to factors such as less favorable environmental conditions, increased predation, impacts of high seas fisheries, or some combination of these. Large concentrations of seals have been observed near the mouth of the Alsek during spring salmon migrations (P. Kissner, Pers. Comm.). Regarding potential impacts by high seas net and trawl fisheries, known changes in fishing patterns since the late 1970s would have been expected to reduce, rather than increase, impacts on chinook returning to these areas (S. Ignell, Pers. Comm.).

Uncertainty exists regarding factors contributing to the lower than expected responses in escapements for the more northerly systems. It might be noted that average 1981-85 inriver returns (catch plus escapement) to the Alsek merely replaced average escapements during the previous 5-year period. This could have important implications regarding appropriateness of current escapement goals. However, if this is due to increased predation, current returns may not reflect potential productivity of inriver spawning and rearing areas.

## CONCLUSIONS AND RECOMMENDATIONS

Conclusions

General conclusions based on the above review are as follows:

- 1.) Conservation measures implemented since 1981 for rebuilding transboundary chinook stocks have generally benefited escapements. During 1981-85, the first cycle of the 3-cycle rebuilding program, average escapements increased in five of the six transboundary rivers compared to the 1975-80 base period. Average escapements to the Alsek declined compared to the base period.
- 2.) The degree of response to conservation measure has been quite variable both between systems and between years within systems. Percentage increases during the first cycle ranged from 457 percent for the Chilkat to 16 percent for the Taku. Average escapements to the Alsek reflected a 30 percent decrease.
- 3.) Based on escapement trends observed since 1981, status of rebuilding, relative to achievement of current management goals, is as follows:
  - Unuk, Chickamin: ahead of schedule; goals expected to be met during second cycle,
  - Stikine, Chilkat: improved relative to base period; current progress uncertain due to lack of clear recent trends,
  - Taku, Alsek: behind schedule; achievement of current goals unlikely given present trends; Taku currently at low percent of goal; Alsek escapements have declined during first cycle.

4.) Information obtained since the rebuilding program began in 1981 suggests that current escapement goals for some systems, particularly the Alsek, may differ from optimum spawning levels expected to maximize harvestable surpluses.

### Recommendations

Based on this review, recommendations are made as follows:

- 1.) Conservation measures implemented for rebuilding of transboundary chinook stocks should be continued.
- 2.) For stocks exhibiting weaker than expected responses since 1981, escapements should be carefully monitored during the early part of the second cycle and incidental chinook catches of those stocks reduced where possible. If escapements do not improve, further conservation measures required to achieve optimum spawning levels by the end of the rebuilding program in 1995 should be considered.
- 3.) A more detailed review of fisheries impacting transboundary stocks should be conducted with emphasis on those stocks for which rebuilding progress appears to be lagging expectations. This review should also include potential non-fishery impacts for the Alsek which has exhibited a decline in average escapements during the first cycle.
- 4.) The managing agencies should complete the review of escapement goals currently being conducted taking into account

information obtained since 1981 and with a view toward reconciling differences which exist.

5.) Consideration should be given to conducting a coded wire tagging program on Alek chinook (perhaps in conjunction with a similar program by ADF&G on the Situk) to better determine migratory patterns of these stocks.

6.) Collection of biological data, including sex ratio data, needed to better define optimum escapement levels for transboundary chinook stocks should be expanded. Validity of expansion factors used to estimate total system escapements should be determined.

7.) Research efforts should be increased on stock identification methods applicable to transboundary chinook stocks.

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Ref. Cited: Kissner, Paul D. 1986 (In Process).  
A study of chinook salmon in Southeast Alaska.  
Alaska Dept. of Fish and Game, Annual Report 1985-86,  
Project F-10-1, 27 (AFS-41).

## FIGURES AND TABLES

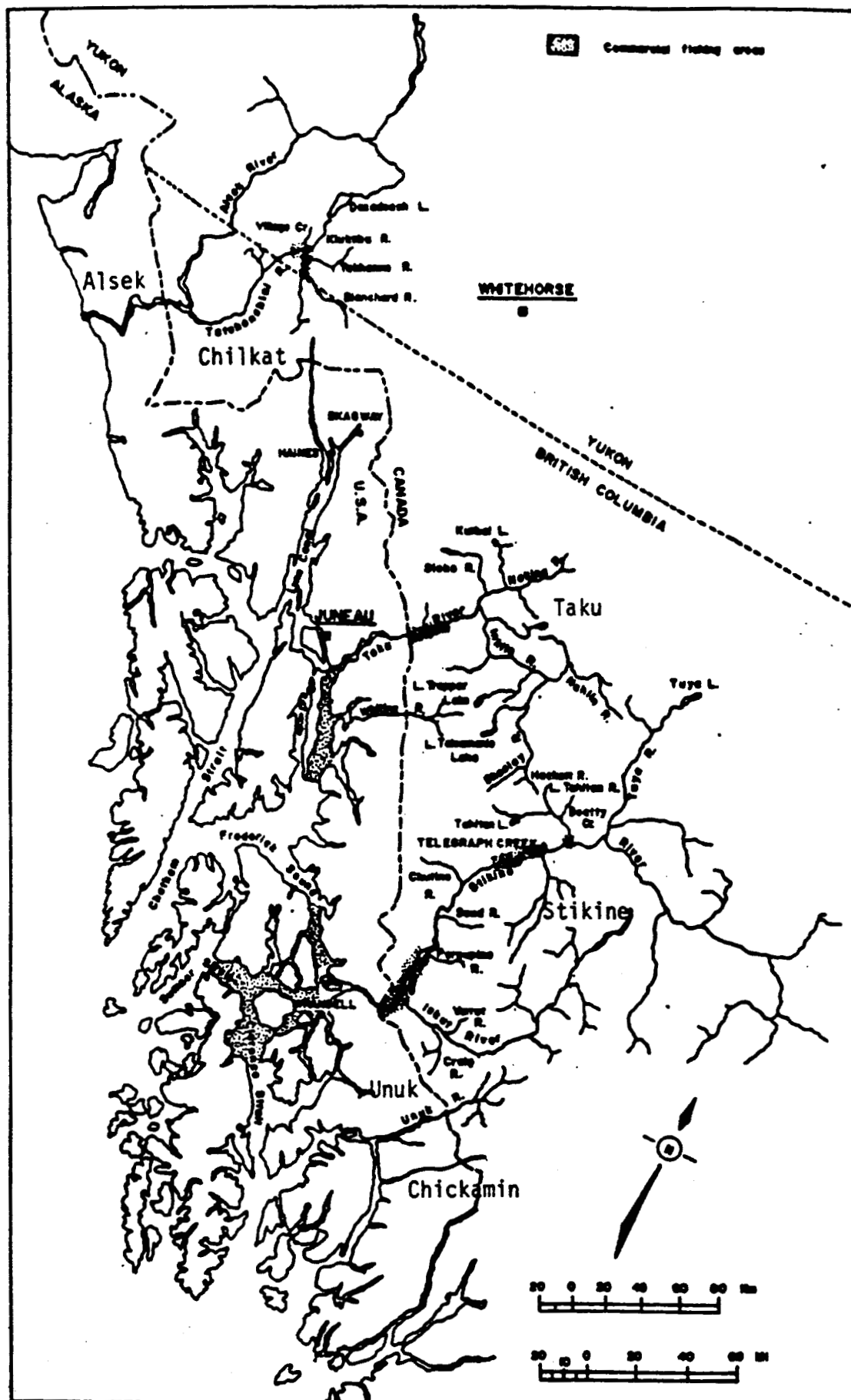


Figure 8. Approximate locations of transboundary chinook salmon systems in northern British Columbia and Southeast Alaska.



# ALSEK RIVER CHINOOK SALMON

EST. TOTAL ESCAPEMENTS THROUGH 1986

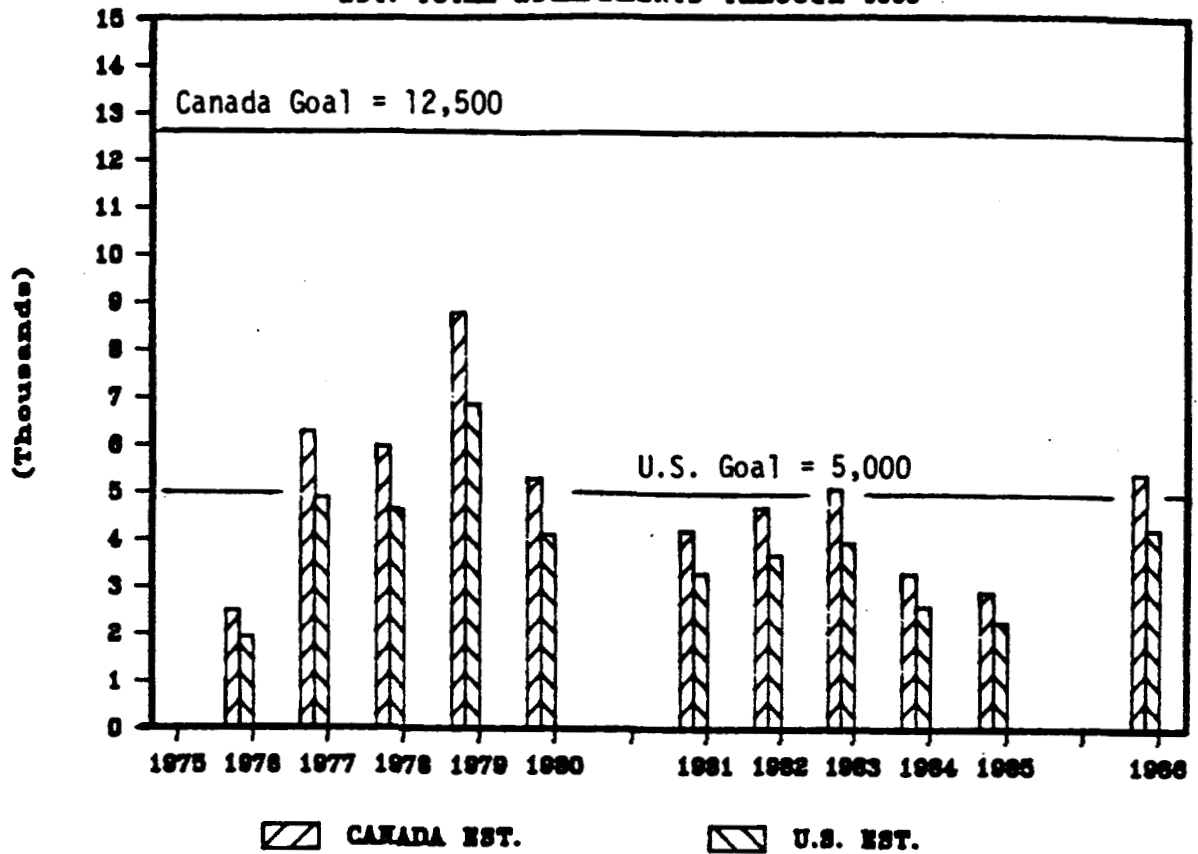


Figure 1. Estimated total chinook salmon escapements to the Alsek River, 1975-86. (2/2/87)

# CHILKAT RIVER CHINOOK SALMON

EST. TOTAL SYSTEM ESCAPEMENTS, 1975-86

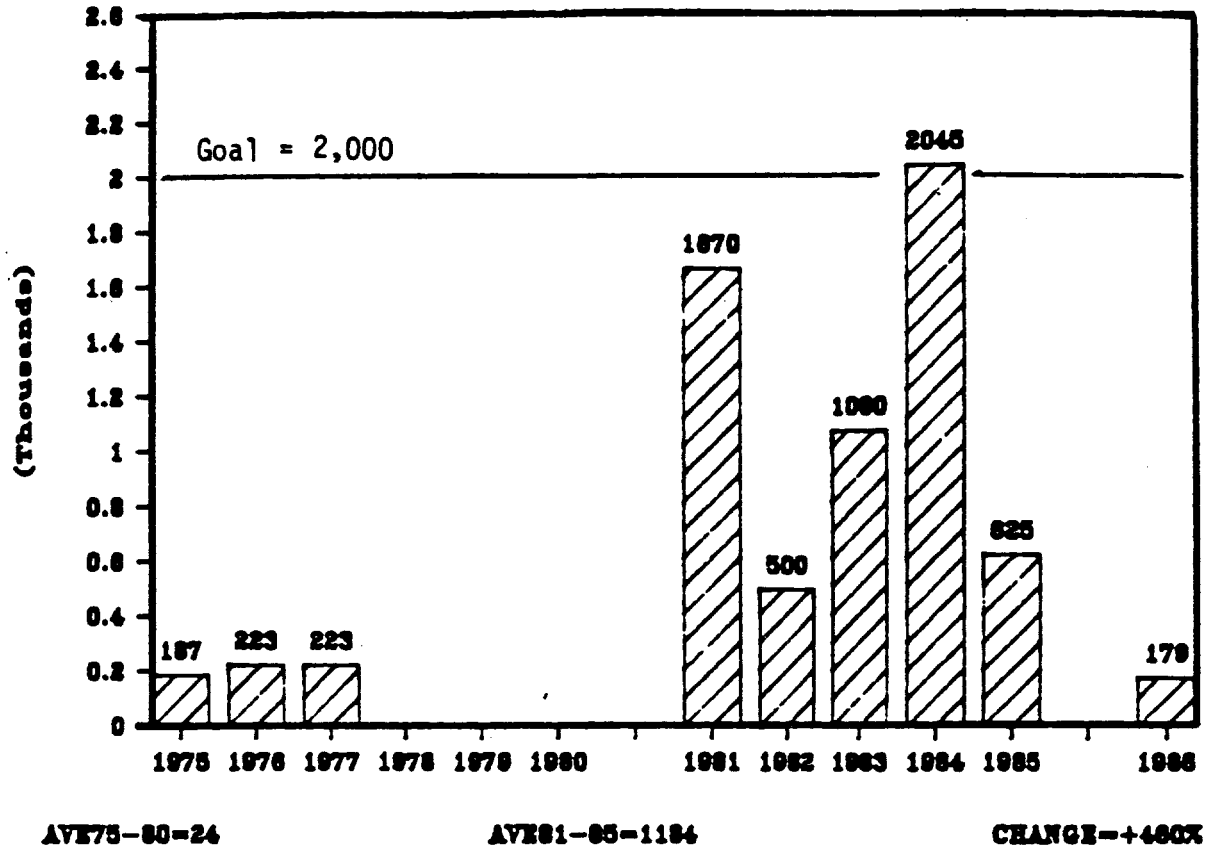


Figure 2 . Estimated total chinook salmon escapements to the Chilkat River, 1975-86. (1/19/87)

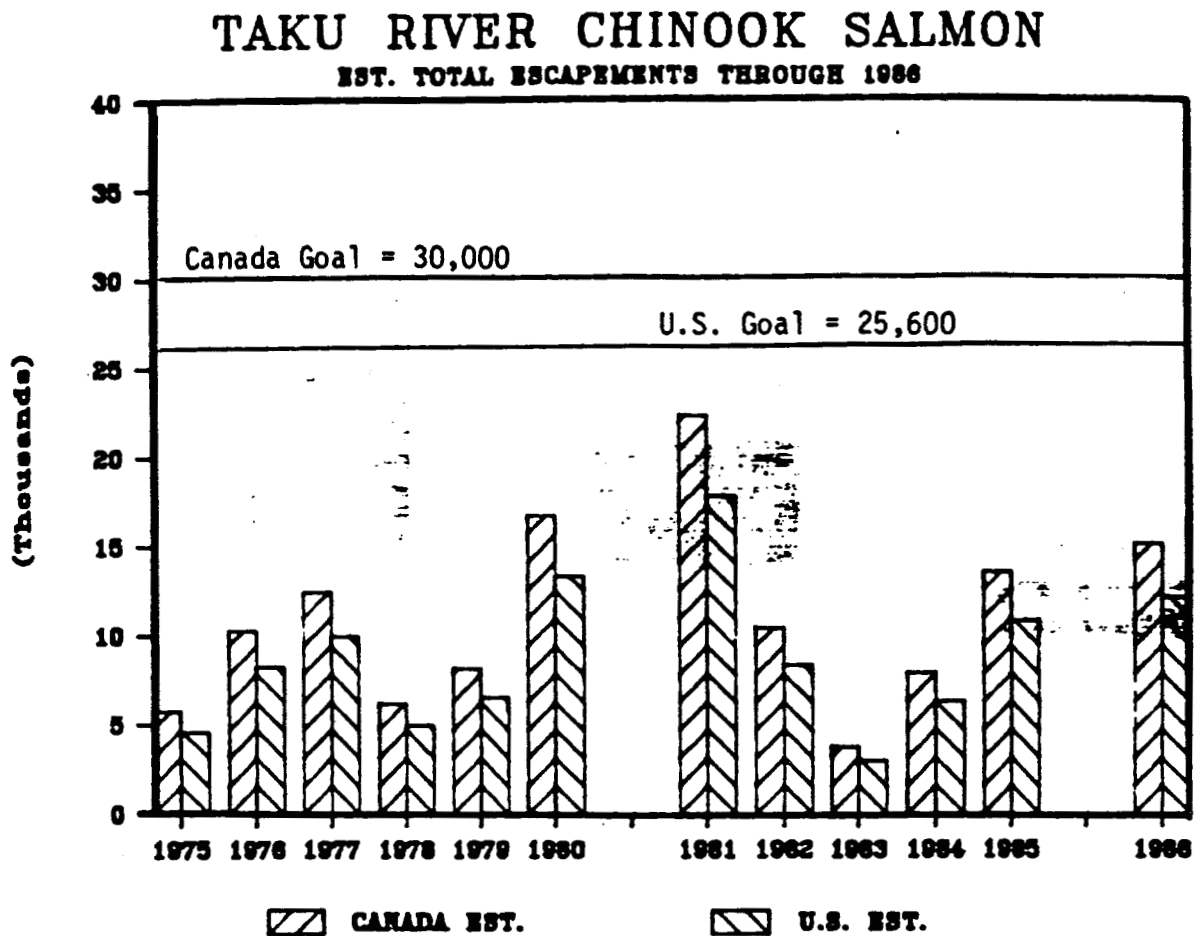


Figure 3. Estimated total chinook salmon escapements to the Taku River, 1975-86. (2/2/87)

# STIKINE RIVER CHINOOK SALMON

EST. TOTAL ESCAPEMENTS THROUGH 1986

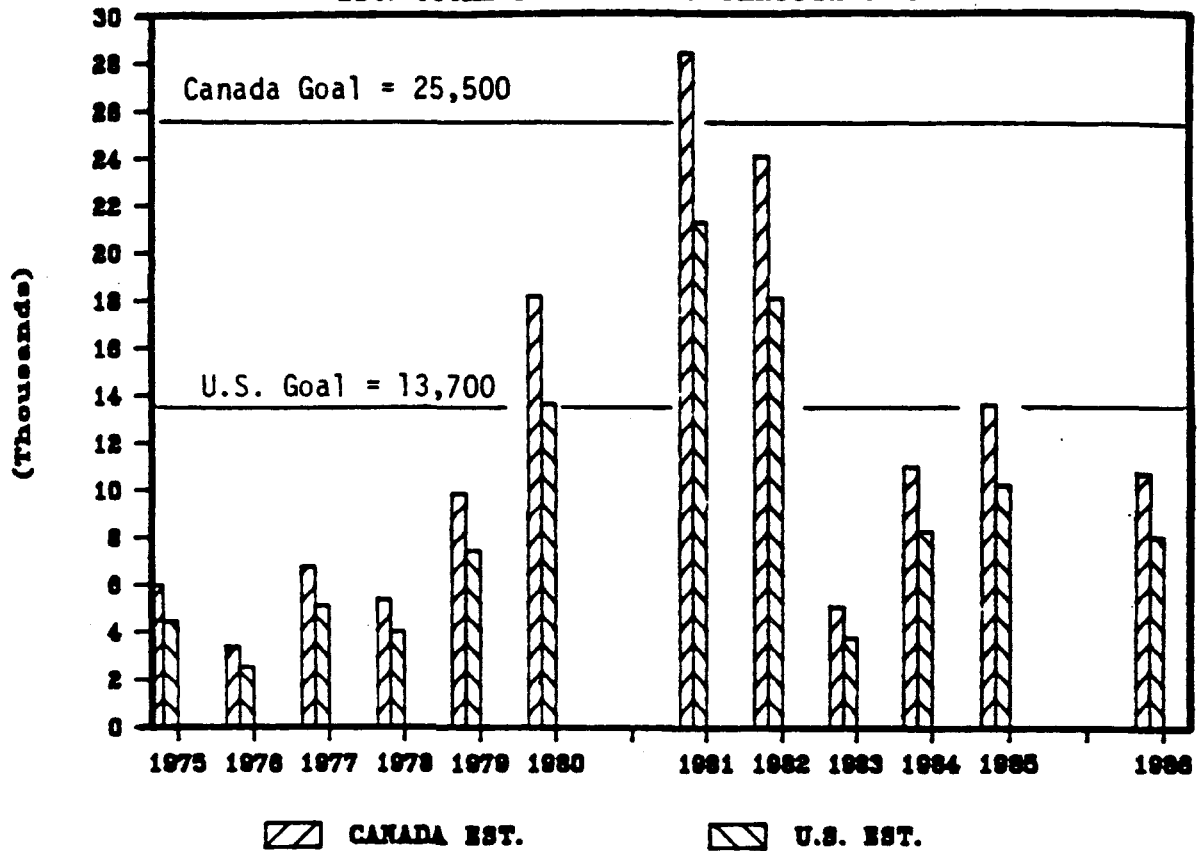


Figure 4. Estimated total chinook salmon escapements to the Stikine River, 1975-86. (2/2/87)

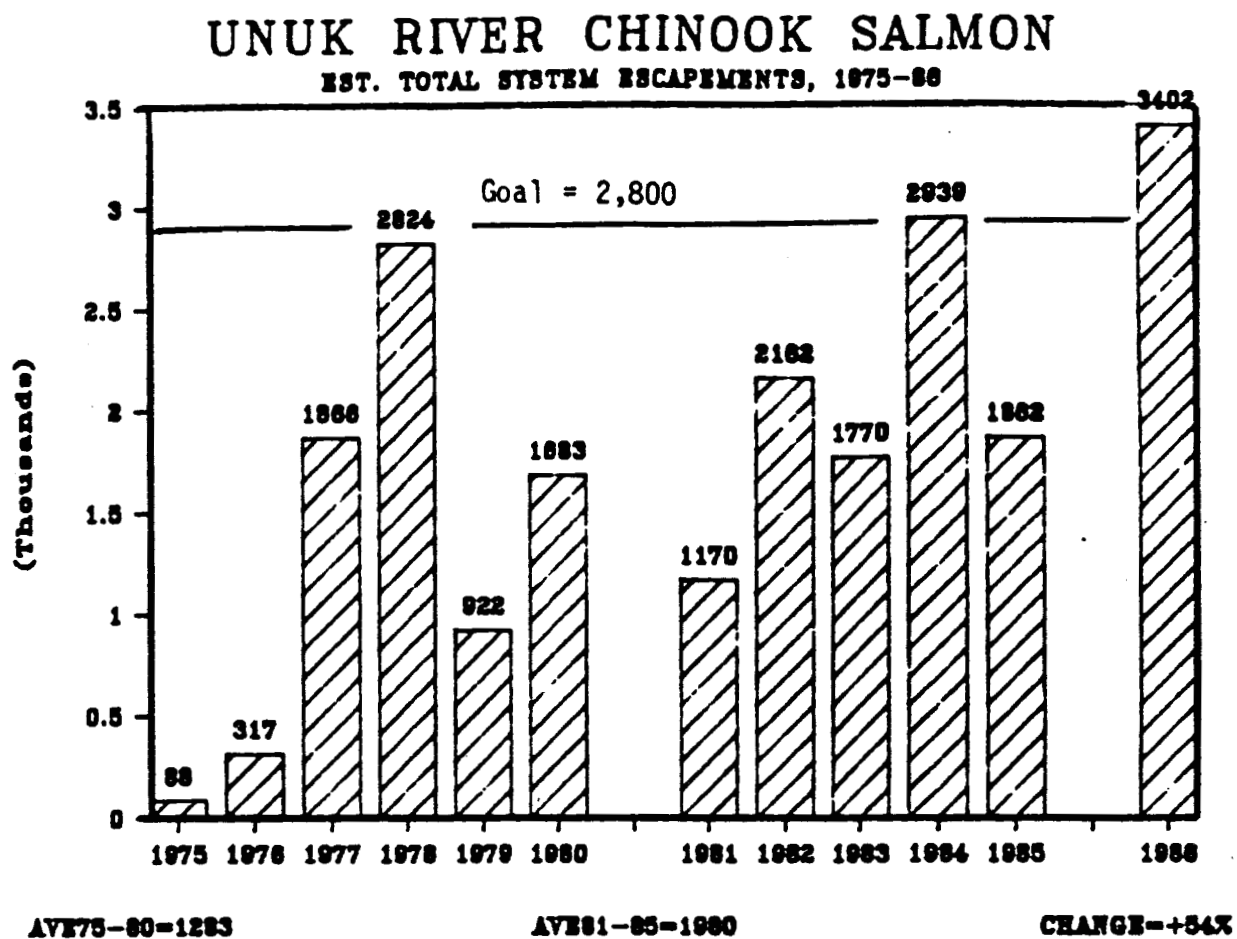


Figure 5 . Estimated total chinook salmon escapements to the Unuk River, 1975-86. (1/19/87)

# CHICKAMIN RIVER CHINOOK SALMON

EST. TOTAL SYSTEM ESCAPEMENTS, 1975-86

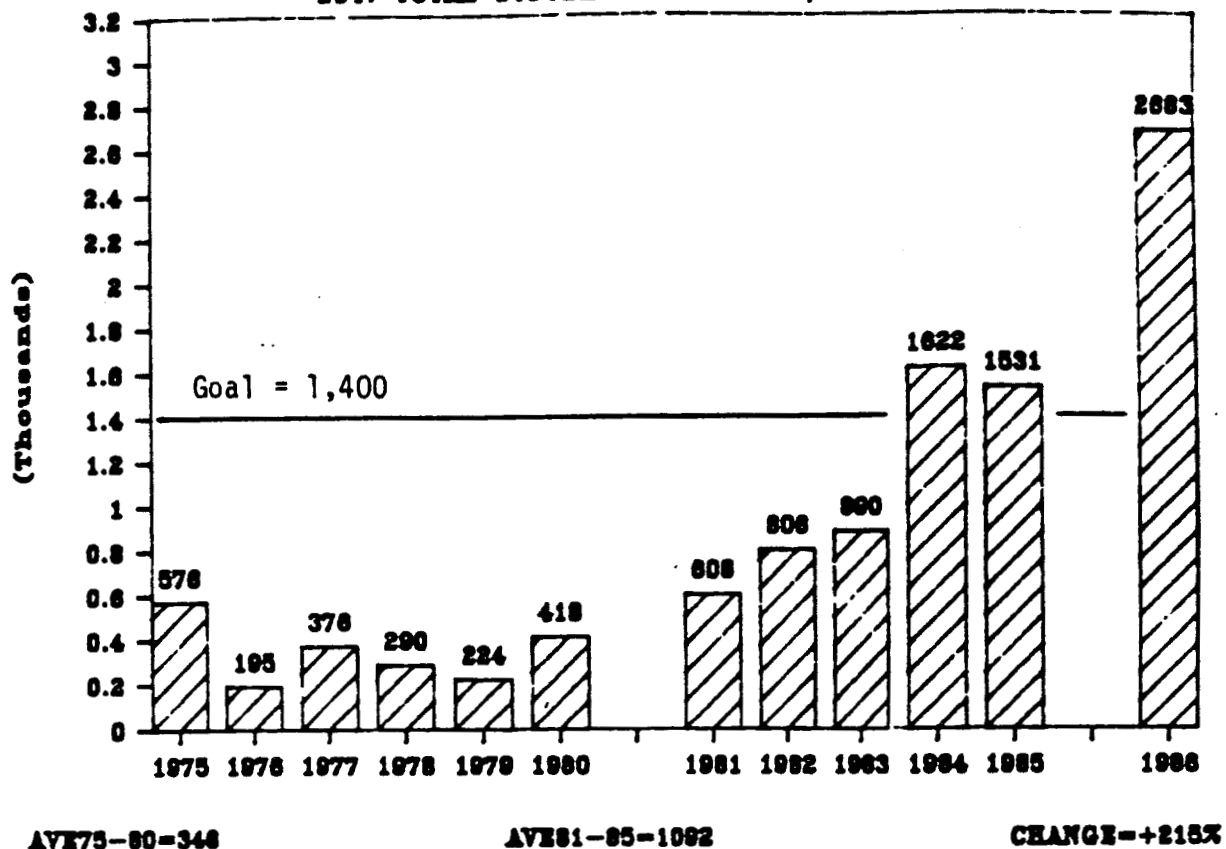


Figure 6. Estimated total chinook salmon escapements to the Chickamin River, 1975-86. (1/19/87)

## TRANSBOUNDARY CHINOOK ESCAPEMENTS

PERCENT CHANGES 1975-80 TO 1981-85

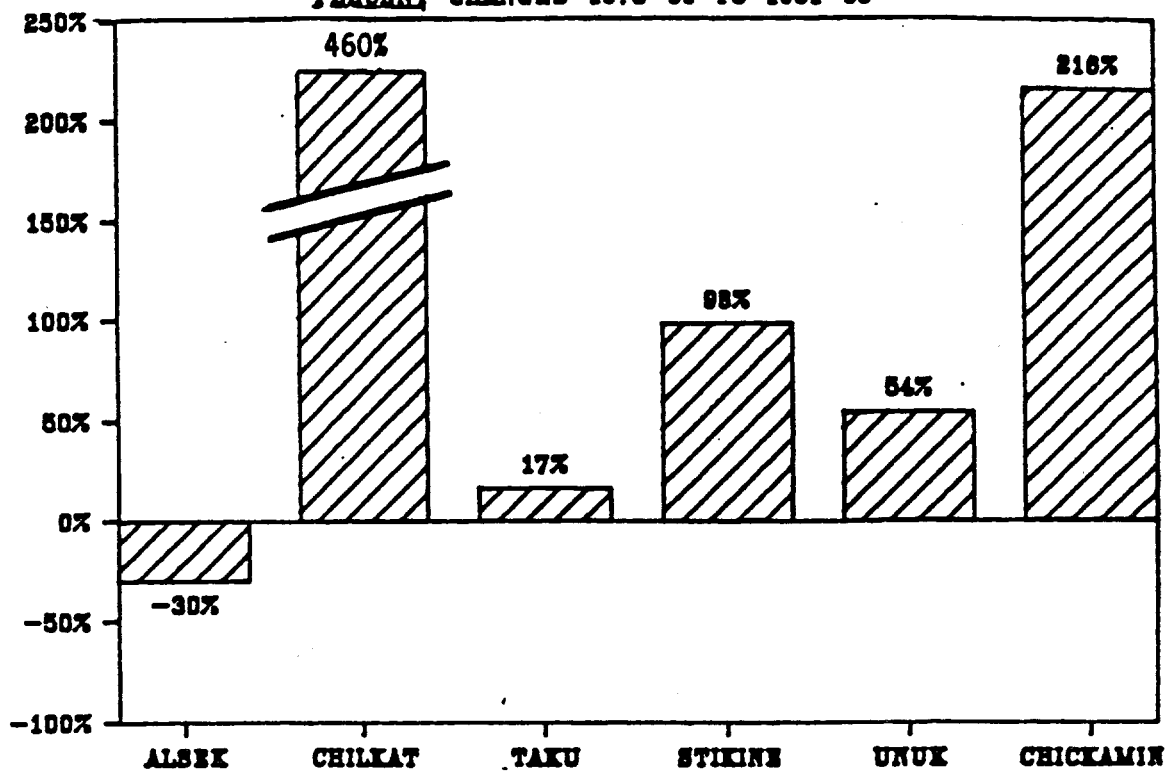


Figure 7. Comparison of average chinook salmon escapements to northern British Columbia and Southeast Alaska transboundary systems from 1975-80 to 1981-85.

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TABLE 1. ESTIMATED ALSEK RIVER CHINOOK SALMON ESCAPEMENTS THROUGH 1986

| INDEX SURVEY COUNT: WEIR COUNT OF ALL SIZE CHINOOK<br>AT THE KLUKSHU WEIR<br>(NOTE: CANADA / U.S. ESTIMATES SHOWN IF DIFFERENT.) |                  |                |                                 |       |                   |              |
|--|------------------|----------------|---------------------------------|-------|-------------------|--------------|
| SURVEY COUNTING RATE =   |                  | 1.000          |                                 |       |                   |              |
| TRIBUTARY COUNTING RATE =  |                  | 0.50           |                                 | /     |                   | 0.64         |
| MANAGEMENT ESCAPEMENT GOAL: INDEX =  |                  | 6,250          |                                 | /     |                   | 3,200        |
| TOTAL =  |                  | 12.500         |                                 | /     |                   | 5.000        |
| -----  |                  |                |                                 |       |                   |              |
| YEAR   | SURVEY<br>METHOD | INDEX<br>COUNT | ESTIMATED TOTAL ESCAPEMENTS     |       |                   |              |
|  |                  |                | NUMBER<br>CANADA                | U.S.  | PERCENT<br>CANADA | GOAL<br>U.S. |
| -----  |                  |                |                                 |       |                   |              |
| ( SURVEY METHOD: A=AERIAL; H=HELICOPTER; F=FOOT; W=WEIR )  |                  |                |                                 |       |                   |              |
| PRE-BASE PERIOD  |                  |                |                                 |       |                   |              |
| 1968   | A                | 1,700          | [1962: 86; 1964: 20; 1965: 100; |       |                   |              |
| 1969   | A                | 700            | 1966: 1,000; 1967: 1,500]       |       |                   |              |
| 1970   | A                | 500            |                                 |       |                   |              |
| 1971   | A                | 300            |                                 |       |                   |              |
| 1972   | A                | 1,100          |                                 |       |                   |              |
| 1974   | A                | 62             |                                 |       |                   |              |
| BASE PERIOD  |                  |                |                                 |       |                   |              |
| 1975   |                  | NA             | NA                              | NA    | NA                | NA           |
| 1976   | W                | 1,244          | 2,500                           | 1,944 | 20%               | 39%          |
| 1977   | W                | 3,144          | 6,300                           | 4,913 | 50%               | 98%          |
| 1978   | W                | 2,976          | 6,000                           | 4,650 | 48%               | 93%          |
| 1979   | W                | 4,403          | 8,800                           | 6,880 | 70%               | 138%         |
| 1980   | W                | 2,637          | 5,300                           | 4,120 | 42%               | 82%          |
| -----  |                  |                |                                 |       |                   |              |
| 1975-80 AVE  |                  | 2,881          | 5,800                           | 4,501 | 46%               | 90%          |
| FIRST CYCLE OR 5-YEAR PERIOD OF REBUILDING PROGRAM   |                  |                |                                 |       |                   |              |
| 1981   | W                | 2,113          | 4,200                           | 3,302 | 34%               | 66%          |
| 1982   | W                | 2,369          | 4,700                           | 3,702 | 38%               | 74%          |
| 1983   | W                | 2,537          | 5,100                           | 3,964 | 41%               | 79%          |
| 1984   | W                | 1,672          | 3,300                           | 2,613 | 26%               | 52%          |
| 1985   | W                | 1,458          | 2,900                           | 2,278 | 23%               | 46%          |
| -----  |                  |                |                                 |       |                   |              |
| 1981-85 AVE  |                  | 2,030          | 4,100                           | 3,172 | 33%               | 63%          |
| PERCENT FROM 1975-80   |                  | -30%           | -29%                            | -30%  |                   |              |
| SECOND CYCLE OF REBUILDING PERIOD  |                  |                |                                 |       |                   |              |
| 1986   | W                | 2,708          | 5,400                           | 4,231 | 43%               | 85%          |
| 1987   |                  |                |                                 |       |                   |              |

Data Sources: 1961-85: Kissner (1986)  
1985-86: CDF0 (S. JOHNSTON) & ADF&G (P. KISSNER)  
management records.

Note: 1.) Surveys prior to 1975 were conducted to obtain general spawning distribution data and may not be directly comparable to later surveys due to incomplete coverage of tributaries and non-peak survey dates.

TABLE 2. ESTIMATED CHILKAT RIVER CHINOOK SALMON ESCAPEMENTS THROUGH 1986

INDEX SURVEY COUNT: PEAK SPAWNING OF 3- AND 4-OCEAN CHINOOK  
IN BIG BOULDER CREEK

SURVEY COUNTING RATE = 0.80

TRIBUTARY COUNTING RATE = 0.14

MANAGEMENT ESCAPEMENT GOAL: INDEX = 225

TOTAL = 2,000

| YEAR  | SURVEY METHOD | INDEX COUNT | ESTIMATED TOTAL ESCAPEMENTS NUMBER | PERCENT GOAL |
|---|---------------|-------------|------------------------------------|--------------|
| ( SURVEY METHOD: A=AERIAL; H=HELICOPTER; F=FOOT; W=WEIR ) |               |             |                                    |              |
| PRE-BASE PERIOD   |               |             |                                    |              |
| 1960  | F             | 316         |                                    |              |
| 1966  | F             | 330         |                                    |              |
| 1967  | F             | 150         |                                    |              |
| 1968  | F             | 259         |                                    |              |
| 1970  | F             | 176         |                                    |              |
| 1974  | F             | 0           |                                    |              |
| BASE PERIOD   |               |             |                                    |              |
| 1975  | F             | 21          | 187                                | 9%           |
| 1976  | F,H           | 25          | 223                                | 11%          |
| 1977  | F,H           | 25          | 223                                | 11%          |
| 1978  | F,H           | NA          | NA                                 | NA           |
| 1979  |               | NA          | NA                                 | NA           |
| 1980  |               | NA          | NA                                 | NA           |
| -----   |               |             |                                    |              |
| 1975-80 AVE   |               | 24          | 211                                | 11%          |
| FIRST CYCLE OR 5-YEAR PERIOD OF REBUILDING PROGRAM        |               |             |                                    |              |
| 1981  | F,H           | 187         | 1670                               | 83%          |
| 1982  | F,H           | 56          | 500                                | 25%          |
| 1983  | F,H           | 121         | 1080                               | 54%          |
| 1984  | F,H           | 229         | 2045                               | 102%         |
| 1985  | F,H           | 70          | 625                                | 31%          |
| -----   |               |             |                                    |              |
| 1981-85 AVE   |               | 133         | 1184                               | 59%          |
| PERCENT FROM 1975-80                                      |               | 460%        | 460%                               |              |
| SECOND CYCLE OF REBUILDING PERIOD                         |               |             |                                    |              |
| 1986  | F,H           | 20          | 179                                | 9%           |
| 1987  |               |             |                                    |              |

Data Sources: 1961-85: Kissner (1986)

1986: ADF&G Mgm't records; P. Kissner

Notes: 1.) Surveys prior to 1975 were conducted to obtain general spawning distribution data and may not be directly comparable to later surveys due to incomplete coverage of tributaries and non-peak survey dates.

TABLE 3a. ESTIMATED TAKU RIVER CHINOOK SALMON ESCAPEMENTS THROUGH 1986

| INDEX SURVEY COUNT: PEAK SPAWNING OF 3- AND 4-OCEAN CHINOOK<br>IN NAKINA AND NAHLIN TRIBUTARIES<br>(NOTE: CANADA / U.S. ESTIMATES SHOWN IF DIFFERENT.) |                  |                |   |        |              |      |     |
|--|------------------|----------------|---|--------|--------------|------|-----|
| SURVEY COUNTING RATE =   |                  | 0.60           | /   | 0.75   |              |      |     |
| TRIBUTARY COUNTING RATE =  |                  | 0.60           |   |        |              |      |     |
| MANAGEMENT ESCAPEMENT GOAL: INDEX =  |                  | 10,800         | /   | 11,500 |              |      |     |
| TOTAL =  |                  | 30,000         | /   | 25,600 |              |      |     |
| -----  |                  |                |   |        |              |      |     |
| YEAR   | SURVEY<br>METHOD | INDEX<br>COUNT | ESTIMATED TOTAL ESCAPEMENTS<br>NUMBER   |        | PERCENT GOAL |      |     |
|  |                  |                | CANADA  | U.S.   | CANADA       | U.S. |     |
| -----  |                  |                |   |        |              |      |     |
| ( SURVEY METHOD: A=AERIAL; H=HELICOPTER; F=FOOT; W=WEIR )  |                  |                |   |        |              |      |     |
| PRE-BASE PERIOD  |                  |                |   |        |              |      |     |
| 1951   | A                | 6,000          | Note: Pre-base period data<br>shown only for years with<br>counts on both Nakina and<br>Nahlin tributaries. For<br>other data refer to<br>Table 3b. |        |              |      |     |
| 1958   | A                | 5,000          |   |        |              |      |     |
| 1965   | A                | 3,087          |   |        |              |      |     |
| 1971   | A                | 1,873          |   |        |              |      |     |
| 1972   | A                | 1,280          |   |        |              |      |     |
| 1973   | A                | 2,300          |   |        |              |      |     |
| 1974   | A                | 2,700          |   |        |              |      |     |
| BASE PERIOD  |                  |                |   |        |              |      |     |
| 1975   | H                | 2,074          | 5,800   | 4,609  | 19%          | 18%  |     |
| 1976   | H                | 3,725          | 10,300  | 8,278  | 34%          | 32%  |     |
| 1977   | H                | 4,500          | 12,500  | 10,000 | 42%          | 39%  |     |
| 1978   | H                | 2,244          | 6,200   | 4,987  | 21%          | 19%  |     |
| 1979   | H                | 2,967          | 8,200   | 6,593  | 27%          | 26%  |     |
| 1980   | H                | 6,031          | 16,800  | 13,402 | 56%          | 52%  |     |
| 1975-80 AVE  |                  |                | 3,590   | 10,000 | 7,978        | 33%  | 31% |
| FIRST CYCLE OR 5-YEAR PERIOD OF REBUILDING PROGRAM   |                  |                |   |        |              |      |     |
| 1981   | H                | 8,055          | 22,400  | 17,900 | 75%          | 70%  |     |
| 1982   | H                | 3,779          | 10,500  | 8,398  | 35%          | 33%  |     |
| 1983   | H                | 1,359          | 3,800   | 3,020  | 13%          | 12%  |     |
| 1984   | H                | 2,838          | 7,900   | 6,307  | 26%          | 25%  |     |
| 1985   | H                | 4,883          | 13,600  | 10,851 | 45%          | 42%  |     |
| 1981-85 AVE  |                  |                | 4,183   | 11,600 | 9,295        | 39%  | 36% |
| PERCENT FROM 1975-80   |                  |                | 17%   | 16%    | 17%          |      |     |
| SECOND CYCLE OF REBUILDING PERIOD  |                  |                |   |        |              |      |     |
| 1986   | H                | 5,480          | 15,200  | 12,178 | 51%          | 48%  |     |
| 1987   |                  |                |   |        |              |      |     |
| -----  |                  |                |   |        |              |      |     |
| Data Sources: 1961-85: Kissner (1986)  |                  |                |   |        |              |      |     |
| 1985-86: CDFO (S. JOHNSTON) & ADF&G (P. KISSNER)   |                  |                |   |        |              |      |     |
| management records.  |                  |                |   |        |              |      |     |

Notes: 1.) Surveys prior to 1975 were conducted to obtain general spawning distribution data and may not be directly comparable to later surveys due to incomplete coverage of tributaries and non-peak survey dates.

Table 3b. Peak Observed Escapement Counts of Chinook Salmon in the Taku River Tributaries.

| Year | Nakina | Kowatua | Tatsamenie | Dudidontu | Tseta            | Nahlin           | Total |
|------|--------|---------|------------|-----------|------------------|------------------|-------|
| 1951 | 5,000  | ...     | ...        | 400       | 100              | 1,000            | 6,500 |
| 1952 | 9,000  | ...     | ...        | ...       | ...              | ...              | 9,000 |
| 1953 | 7,500  | ...     | ...        | ...       | ...              | ...              | 7,500 |
| 1954 | 6,000  | ...     | ...        | ...       | ...              | ...              | 6,000 |
| 1955 | 3,000  | ...     | ...        | ...       | ...              | ...              | 3,000 |
| 1956 | 1,380  | ...     | ...        | ...       | ...              | ...              | 1,380 |
| 1957 | 1,500* | ...     | ...        | ...       | ...              | ...              | 1,500 |
| 1958 | 2,500* | ...     | ...        | 4,500     | ...              | 2,500            | 9,500 |
| 1959 | 4,000* | ...     | ...        | ...       | ...              | ...              | 4,000 |
| 1960 | Poor   | ...     | ...        | ...       | ...              | ...              | Poor  |
| 1961 | Poor   | ...     | ...        | ...       | ...              | ...              | Poor  |
| 1962 | ...    | ...     | ...        | 25        | 81               | 216              | 322   |
| 1963 | ...    | ...     | ...        | ...       | ...              | ...              | ...   |
| 1964 | ...    | ...     | ...        | ...       | ...              | ...              | ...   |
| 1965 | 3,050  | 200 G   | 50 G       | 100       | 18               | 37               | 3,455 |
| 1966 | ...    | 14 G    | 150 G      | 267       | 150              | 300              | 881   |
| 1967 | ...    | 250 G   | ...        | 600       | 350              | 300              | 1,500 |
| 1968 | ...    | 1,100 E | 800 E      | 640       | 230              | 450              | 3,220 |
| 1969 | ...    | 3,300 E | 800 E      | ...       | ...              | ...              | 4,100 |
| 1970 | ...    | 1,200 E | 530 E      | 10        | 25               | 26               | 1,791 |
| 1971 | ...    | 1,400 E | 320 E      | 165       | ...              | 473              | 2,358 |
| 1972 | 1,000  | 130 G   | 170 G      | 103       | 80               | 280              | 1,763 |
| 1973 | 2,000  | 100 G   | 200 G      | 200       | ...              | 300              | 2,800 |
| 1974 | 1,800  | 235 G   | 120 G      | 20        | 4                | 900              | 3,079 |
| 1975 | 1,800  | ...     | ...        | 15        | ...              | 274              | 2,089 |
| 1976 | 3,000  | 341 G   | 620 E      | 40        | ...              | 725              | 4,726 |
| 1977 | 3,850  | 580 G   | 573 E      | 18        | ...              | 650              | 5,671 |
| 1978 | 1,620  | 490 G   | 550 E      | ...       | 21               | 624              | 3,305 |
| 1979 | 2,110  | 430 G   | 750 E      | 9         | ...              | 857              | 4,156 |
| 1980 | 4,500  | 450 G   | 905 E      | 158       | ...              | 1,531            | 7,544 |
| 1981 | 5,110  | 560 G   | 839 E      | 74        | 258              | 2,945            | 9,786 |
| 1982 | 2,533  | 289 E   | 387 E      | 130       | 228              | 1,246            | 4,813 |
| 1983 | 968    | 171 E   | 236 E      | 117       | 179              | 391              | 2,062 |
| 1984 | 1,887  | 279 E   | 616 E      | ...       | 176 <sup>a</sup> | 951 <sup>b</sup> | 3,909 |
| 1985 | 2,647  | 699 E   | 848 E      | 476       | 303              | 2,236            | 7,209 |
| 1986 | 3,868  | 548 E   | 886 E      | 413       | 193              | 1,612            | 7,520 |

a = surveyed only upper 2 miles - partial survey

b = surveyed only above beaver dam valley - total enumerated = 521 - adjustment made for total area, using spawner distribution data collected in past years as follows: above dams = 54.8%, in dams = 23.2%, and below dams to Telegraph Trail = 22.0%.

G = water glacial

E = water clear

\* = Counts of total river not conducted - comparison made from carcass weir enumeration

TABLE 4. ESTIMATED STIKINE RIVER CHINOOK SALMON ESCAPEMENTS THROUGH 1986

|   |               |             |                             |        |              |      |
|---|---------------|-------------|-----------------------------|--------|--------------|------|
| INDEX SURVEY COUNT: PEAK SPAWNING OF 3- AND 4-OCEAN CHINOOK<br>IN LITTLE TAHLTAN RIVER<br>(NOTE: CANADA / U.S. ESTIMATES SHOWN IF DIFFERENT.) |               |             |                             |        |              |      |
| SURVEY COUNTING RATE =  |               | 0.47        | /                           | 0.625  |              |      |
| TRIBUTARY COUNTING RATE =   |               | 0.25        |                             |        |              |      |
| MANAGEMENT ESCAPEMENT GOAL: INDEX =   |               | 3,000       | /                           | 2,137  |              |      |
|   |               | TOTAL =     | 25,500                      | /      | 13,700       |      |
| -----   |               |             |                             |        |              |      |
|   |               |             | ESTIMATED TOTAL ESCAPEMENTS |        |              |      |
|   |               |             | NUMBER                      |        | PERCENT GOAL |      |
| YEAR  | SURVEY METHOD | INDEX COUNT | CANADA                      | U.S.   | CANADA       | U.S. |
| -----   |               |             |                             |        |              |      |
| ( SURVEY METHOD: A=AERIAL; H=HELICOPTER; F=FOOT; W=WEIR )   |               |             |                             |        |              |      |
| PRE-BASE PERIOD   |               |             |                             |        |              |      |
| 1956  | A             | 493         |                             |        |              |      |
| 1957  | A             | 199         |                             |        |              |      |
| 1958  | A             | 790         |                             |        |              |      |
| 1959  | A             | 198         |                             |        |              |      |
| 1960  | A             | 346         |                             |        |              |      |
| 1967  | A             | 800         |                             |        |              |      |
| BASE PERIOD   |               |             |                             |        |              |      |
| 1975  | H             | 700         | 8,000                       | 4,480  | 24%          | 93%  |
| 1976  | H             | 400         | 3,400                       | 2,560  | 13%          | 19%  |
| 1977  | H             | 800         | 6,800                       | 5,120  | 27%          | 37%  |
| 1978  | H             | 632         | 5,400                       | 4,045  | 21%          | 30%  |
| 1979  | H             | 1,166       | 9,900                       | 7,462  | 39%          | 54%  |
| 1980  | H             | 2,137       | 18,200                      | 13,677 | 71%          | 100% |
| -----   |               |             |                             |        |              |      |
| 1975-80 AVE   |               | 973         | 8,300                       | 6,224  | 33%          | 45%  |
| FIRST CYCLE OR 5-YEAR PERIOD OF REBUILDING PROGRAM  |               |             |                             |        |              |      |
| 1981  | H             | 3,334       | 28,400                      | 21,338 | 111%         | 156% |
| 1982  | H             | 2,830       | 24,100                      | 18,112 | 95%          | 132% |
| 1983  | H             | 594         | 5,100                       | 3,802  | 20%          | 28%  |
| 1984  | H             | 1,294       | 11,000                      | 8,282  | 43%          | 60%  |
| 1985  | H             | 1,598       | 13,600                      | 10,227 | 53%          | 75%  |
| -----   |               |             |                             |        |              |      |
| 1981-85 AVE   |               | 1,930       | 16,400                      | 12,352 | 64%          | 90%  |
| PERCENT FROM 1975-80  |               | 98%         | 98%                         | 98%    |              |      |
| SECOND CYCLE OF REBUILDING PERIOD   |               |             |                             |        |              |      |
| 1986  | H             | 1,254       | 10,700                      | 8,026  | 42%          | 59%  |
| 1987  |               |             |                             |        |              |      |

Data Sources: 1961-85: Kissner (1986)  
1985-86: CDFO (S. JOHNSTON) & ADF&G (P. KISSNER)  
management records.

Notes: 1.) Surveys prior to 1975 were conducted to obtain general spawning distribution data and may not be directly comparable to later surveys due to incomplete coverage of tributaries and non-peak survey dates.

TABLE 5. ESTIMATED UNUK RIVER CHINOOK SALMON ESCAPEMENTS THROUGH 1986

INDEX SURVEY COUNT: PEAK SPAWNING OF 3- AND 4-OCEAN CHINOOK  
 SURVEY COUNTING RATE = 0.625  
 TRIBUTARY COUNTING RATE = 1.0  
 MANAGEMENT ESCAPEMENT GOAL: INDEX = 1,765  
 TOTAL = 2,800

| YEAR  | SURVEY METHOD | INDEX COUNT | ESTIMATED TOTAL ESCAPEMENTS NUMBER | PERCENT GOAL |
|---|---------------|-------------|------------------------------------|--------------|
| ( SURVEY METHOD: A=AERIAL; H=HELICOPTER; F=FOOT; W=WEIR ) |               |             |                                    |              |
| PRE-BASE PERIOD   |               |             |                                    |              |
| 1961  | F             | 673         |                                    |              |
| 1962  | A             | 331         |                                    |              |
| 1963  | A             | 1070        |                                    |              |
| 1968  | A             | 650         |                                    |              |
| 1969  | A             | 475         |                                    |              |
| 1972  | A             | 885         |                                    |              |
| 1973  | H             | 182         |                                    |              |
| BASE PERIOD   |               |             |                                    |              |
| 1975  | H             | 55          | 88                                 | 3%           |
| 1976  | H             | 198         | 317                                | 11%          |
| 1977  | H,W,F         | 1166        | 1866                               | 67%          |
| 1978  | H,W,F         | 1785        | 2824                               | 101%         |
| 1979  | H,W,F         | 576         | 922                                | 33%          |
| 1980  | H,W,F         | 1052        | 1683                               | 60%          |
| 1975-80 AVE   |               | 802         | 1283                               | 46%          |
| FIRST CYCLE OR 5-YEAR PERIOD OF REBUILDING PROGRAM        |               |             |                                    |              |
| 1981  | H,W,F         | 731         | 1170                               | 42%          |
| 1982  |               | 1351        | 2162                               | 77%          |
| 1983  |               | 1106        | 1770                               | 63%          |
| 1984  |               | 1837        | 2939                               | 105%         |
| 1985  |               | 1164        | 1862                               | 67%          |
| 1981-85 AVE   |               | 1238        | 1980                               | 71%          |
| PERCENT FROM 1975-80                                      |               | 54%         | 54%                                |              |
| SECOND CYCLE OF REBUILDING PERIOD                         |               |             |                                    |              |
| 1986  |               | 2126        | 3402                               | 121%         |
| 1987  |               |             |                                    |              |

Data Sources: 1961-85: Kissner (1986)  
 1986: ADF&G Mgm't records; P. Kissner

- Notes: 1.) Surveys prior to 1975 were conducted to obtain general spawning distribution data and may not be directly comparable to later surveys due to incomplete coverage of tributaries and non-peak survey dates.  
 2.) Surveys since 1975 include the following tributaries: Cripple Cr., Genes Lake, Eulachon, Clear, Lake Cr., Kerr.

TABLE 6. ESTIMATED CHICKAMIN R. CHINOOK SALMON ESCAPEMENTS THROUGH 1986

INDEX SURVEY COUNT: PEAK SPAWNING OF 3- AND 4-OCEAN CHINOOK  
 SURVEY COUNTING RATE = 0.625  
 TRIBUTARY COUNTING RATE = 1.0  
 MANAGEMENT ESCAPEMENT GOAL: INDEX = 860  
 TOTAL = 1,400

| YEAR  | SURVEY METHOD | INDEX COUNT | ESTIMATED TOTAL ESCAPEMENTS NUMBER | PERCENT GOAL |
|---|---------------|-------------|------------------------------------|--------------|
| ( SURVEY METHOD: A=AERIAL; H=HELICOPTER; F=FOOT; W=WEIR ) |               |             |                                    |              |
| PRE-BASE PERIOD   |               |             |                                    |              |
| 1961  | F             | 336         |                                    |              |
| 1962  | A             | 775         |                                    |              |
| 1963  | A             | 450         |                                    |              |
| 1969  | A             | 345         |                                    |              |
| 1972  | A             | 860         |                                    |              |
| 1973  | H             | 229         |                                    |              |
| 1974  | H             | 176         |                                    |              |
| BASE PERIOD   |               |             |                                    |              |
| 1975  | H             | 360         | 576                                | 41%          |
| 1976  | H             | 122         | 195                                | 14%          |
| 1977  | H             | 235         | 376                                | 27%          |
| 1978  | H             | 181         | 290                                | 21%          |
| 1979  | H             | 140         | 224                                | 16%          |
| 1980  | H             | 261         | 418                                | 30%          |
| 1975-80 AVE   |               | 217         | 348                                | 25%          |
| FIRST CYCLE OR 5-YEAR PERIOD OF REBUILDING PROGRAM        |               |             |                                    |              |
| 1981  | H             | 380         | 608                                | 43%          |
| 1982  | H             | 504         | 806                                | 58%          |
| 1983  | H             | 556         | 890                                | 64%          |
| 1984  | H             | 1014        | 1622                               | 116%         |
| 1985  | H             | 957         | 1531                               | 109%         |
| 1981-85 AVE   |               | 682         | 1092                               | 78%          |
| PERCENT FROM 1975-80                                      |               | 215%        | 215%                               |              |
| SECOND CYCLE OF REBUILDING PERIOD                         |               |             |                                    |              |
| 1986  | H             | 1677        | 2683                               | 192%         |
| 1987  |               |             |                                    |              |

Data Sources: 1961-85: Kissner (1986)  
 1986: ADF&G Mgm't records; P. Kissner

- Notes: 1.) Surveys prior to 1975 were conducted to obtain general spawning distribution data and may not be directly comparable to later surveys due to incomplete coverage of tributaries and non-peak survey dates.
- 2.) Surveys since 1975 include the following tributaries: S. Fork, Barrier, Butler, Leduc, Indian, Humpy, King, El Paso, Clear Falls.

TABLE 7. PERCENT CHANGES IN AVERAGE CHINOOK ESCAPEMENTS TO NORTHERN  
BRITISH COLUMBIA AND SOUTHEAST ALASKA TRANSBOUNDARY  
SYSTEMS SINCE 1975. (FILE: SUMMARY.WK1; 2/2/87)

| SYSTEM    | ESTIMATED TOTAL AVERAGE ESCAPEMENTS |               |                   |               |                   |                |                |
|-----------|-------------------------------------|---------------|-------------------|---------------|-------------------|----------------|----------------|
|           | 1975-80<br>CANADA                   | ESTS.<br>U.S. | 1981-85<br>CANADA | ESTS.<br>U.S. | PERCENT<br>CHANGE | 1986<br>CANADA | ESCAP.<br>U.S. |
| ALSEK     | 5,800                               | 4,501         | 4,100             | 3,161         | -30%              | 5,400          | 4,231          |
| CHILKAT   |                                     | 211           |                   | 1,184         | 461%              |                | 179            |
| TAKU      | 10,000                              | 7,978         | 11,600            | 9,295         | 17%               | 15,200         | 12,178         |
| STIKINE   | 8,300                               | 6,224         | 16,400            | 12,352        | 98%               | 10700          | 8,026          |
| UNUK      |                                     | 1,283         |                   | 1,980         | 54%               |                | 3,402          |
| CHICKAMIN |                                     | 346           |                   | 1,092         | 216%              |                | 2,683          |

Note: Refer to tables 1-6 for detail system data. Small (1%)  
absolute differences exist in the percent changes due  
to rounding.